Lesson 8

Distribute HW3 – due October 30

Return Midterm 1

Average: 27.3
Median: 27.5
Grade Range:
4.0: 38+
3.7-3.9: 32.5-37.5
3.4-3.6: 27-32
3.1-3.3: 22-27
2.8-3.0: 15.5-21.5
<2.8: <=15

Come see me if you scored below 18.
Work in groups (if not already doing so)

Review problem 4 on test.

Chapter 7

IDEA: HOW MUCH OUTPUT SHOULD THE FIRM PRODUCE, AND HOW MUCH INPUTS SHOULD IT USE TO PRODUCE THIS INPUT.

Factors (or Inputs) of production – labor, capital (e.g., machines, land), energy, raw materials
Production Function: Q = f(L,K)

Loaves of Bread = (5 * Number of Ovens) * (Pounds of Batter/2) * (Hours of Labor)^1/2

Fixed Inputs – those that cannot change quickly. For example, I may have a fixed number of ovens, but a variable amount of Batter and Labor.

Total Product = Q
Average Product of Labor (APL) = Q/Labor
Marginal Product of Labor (MPL) = Change in Q / Change in Labor

What would Average/Marginal Product of Capital Mean?

Redraw Figure 7.1 on page 177. Explain the slope of the TP curve – note this equals MPL.
Why would the MPL rise? Fall? Be negative?
Why does MPL = APL at APL maximum?
Go over problem:

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Short-run: some inputs are fixed
Long-run: all inputs are variable (short-run and long-run supply curves will be different)

Isoquant – combination of L and K such that Q is constant. Like an indifference curve.

Draw examples. Why are they typically convex? If the firm’s isoquants were straight lines, what would this imply about the two inputs?

Slope of isoquant is called the Marginal Rate of Technical Substitution (MRTS) – the amount by which capital can be reduced without changing output if you increase labor by one unit - slope of the isoquant = ΔK/ΔL.

\[
\text{MRTS} = \Delta K / \Delta L = \frac{MPL}{MPK}
\]

Proof:

Holding K constant: \(\Delta Q = \Delta L \cdot MPL\)
Holding L constant: \(\Delta Q = \Delta K \cdot MPk\)
Along isoquant, \(\Delta Q = 0\)

\[
\Delta L \cdot MPL - \Delta K \cdot MPK = 0
\]
\[
\Delta L \cdot MPL = \Delta K \cdot MPK
\]
\[
\Delta K / \Delta L = MPL / MPK
\]

This is similar to the concept with indifference curves:

\[
\text{MRS} = \frac{MUx}{MUy}
\]

****

Wednesday we will add something like a budget constraint. We will find that profit maximizing choice is where MRTS = price ratio.

****
Constant returns to scale (CRTS): If you multiply all the factors by X, total product will be multiplied by X. For example, if every factor is doubled, output will double. If every factor is halved, output will be halved.

IRTS: If you multiply all the factors by X, total product will be multiplied by more than X.
DRTS: If you multiply all the factors by X, total product will be multiplied by less than X.

Discuss pin production (p. 187) – what does Adam Smith’s observation imply about RTS. Why can't you always get IRTS by doubling your inputs?

Go over the following only if time permits

Discuss the Cobb-Douglas Production Function.

\[ Q = aK^bL^c \]

Discuss Natural Logs

\[ \ln(x\cdot y) = \ln(x) + \ln(y) \]
\[ \ln(x^y) = y\cdot \ln(x) \]

Take natural logs of Q

\[ \ln(Q) = \ln(aK^bL^c) \]
\[ = \ln(a) + \ln(K)^b + \ln(L)^c \]
\[ = \ln(a) + b\cdot \ln(K) + c\cdot \ln(L) \]

Discuss scatterplot of Q and L. Q and K. Three-dimensional.

This can now be estimated using a regression – taught in PBAF 528. The constant will equal \( \ln(a) \), and the parameters will be the estimates of b and c.

Suppose \( Q=10\cdot L^{0.1}\cdot K^{0.9} \)

How would we compute the APL and MPL of this function given \( L=10, K=20 \)? How could we test for CRTS?
**Lesson 9**

**Short-run costs – in the short run some inputs are fixed.**

\[ \text{TFC} = \text{FC} - \text{cost of fixed inputs} \]
\[ \text{TVC} = \text{VC} - \text{cost of variable inputs given } q \]
\[ \text{TC} = \text{C} - \text{cost of all inputs given } q. = \text{FC} + \text{VC} \]
\[ \text{MC} - \text{the cost of producing an additional unit of output given we have produced } q \text{ units already.} = \frac{\Delta \text{TC}}{\Delta Q} \]
\[ \text{AFC} = \frac{\text{FC}}{Q} \]
\[ \text{AVC} = \frac{\text{VC}}{Q} \]
\[ \text{AC} = \frac{\text{TC}}{Q} = \text{AFC} + \text{AVC} \]

Discuss why AC and AVC falls if MC<AC.

Show why \( MC = w/\text{MPL} \) (if labor is the only variable input)

\[ \text{MPL} = \frac{\Delta Q}{\Delta L} \]
\[ \text{MC} = \frac{\Delta \text{TC}}{\Delta Q} = \frac{\Delta \text{VC}}{\Delta Q} = w\Delta L / \Delta Q = w / (\Delta Q / \Delta L) = w / \text{MPL} \]

Why does this make sense? Answer: If w is high, cost of producing an extra unit of output is high; If MPL is high, cost of producing an extra unit of output is low because it requires little labor.

Graph the curves. Note: Short-run MC curve is U-Shaped due to the law of diminishing marginal returns—as you add more of the variable input, the change in output will eventually diminish. How does this differ from Returns to Scale?

*Suppose MC was constant and equal to 10 and Fixed costs = 100. Graph AFC, AVC, ATC, MC.*

**NEXT WEEK, WE WILL USE THESE CURVES TO DETERMINE HOW MUCH OUTPUT THE FIRM SHOULD PRODUCE IN THE SHORT RUN – THIS WILL LEAD TO A SUPPLY CURVE FOR THE FIRM AND FOR THE INDUSTRY.**

3) **Long-run costs – in the long run everything is variable**

Price of labor = w
Price of capital = r = rental rate per unit of capital

Isocost line – just like a consumer’s budget constraint – combinations of capital and labor that can be purchased at a given total cost.

\[ wL + rK = \text{Total Cost} \]
Suppose \( w = $12 \) and \( r = $3 \) and \( TC = $360 \). Draw the Isocost line. What is its slope?

\[
\text{Slope} = \frac{w}{r} = \frac{12}{3} = 4
\]

– means that one unit of labor costs you four units of capital.

Add Isoquant line. Discuss why \( MRTS = \frac{w}{r} \).

Last class we proved that \( MRTS = \frac{\text{MPL}}{\text{MPK}} \).

Note that \( MRTS = \frac{w}{r} \) yields the following:

\[
\frac{\text{MPL}}{w} = \frac{\text{MPK}}{r} \quad \text{– bang for the buck—analag: } \frac{\text{MU}_x}{P_x} = \frac{\text{MU}_y}{P_y}
\]

Explain.

Give them a problem to do:

**Suppose \( w=8, r=5, TC=1400 \). Suppose the MRTS = \( \frac{2K}{5L} \). Find the optimal choice of \( K \) and \( L \)**

\[
\begin{align*}
\text{Price ratio} & = \frac{8}{5} \\
2K / 5L & = \frac{8}{5} \\
10K & = 40L \\
K & = 4L
\end{align*}
\]

\[
\begin{align*}
8^L + 5^4^L & = 1400 \\
28L & = 1400 \\
L & = 50 \\
K & = 200
\end{align*}
\]

\[
\text{Check: } (200)/5*50 = 400/250 = 800/500 = 8/5
\]

Discuss Expansion Path. **What would happen if \( TC=2800 \)?** Show this graphically.

\( L=100, K=400 \).

What firm actually does is minimize cost for a given \( Q \).

***

What would happen if price of labor rises? Diagram the input substitution effect. How is this comparable to the substitution effect we discussed for consumers?

Go back to practice problem. **Suppose \( w=10 \). Recompute:**

\[
\begin{align*}
\text{Price ratio} & = \frac{10}{5} \\
2K / 5L & = \frac{2}{1} \\
2^K & = 10^L
\end{align*}
\]
\[ K = 5L \]

\[ 8L + 5 \times 5L = 1400 \]
\[ 33L = 1400 \]
\[ L = 42.4 \]
\[ K = 212.1 \]

Check: \[ 2(212)/5 \times 42.4 = 424/212 = 2 \]

Show what happens to MC and AC curves in this case.

4) Long-Run Cost Curves

Why are MC and AC curves U-Shaped? Different Reason – Changes in Returns to scale

Returns to scale – if we double inputs, do we get more or less than double the output?
Typically:

Q is low: IRTS
Q is medium: CRTS
Q is high: DRTS

Example to show that MC is falling when we have IRTS

Suppose that we have the following:
L=50
K=100
Q = 10
W=$10
R=$30
IRTS

Compute the firm’s APL=10/50 = 0.2.
Holding K constant, compute the firm’s MC = w/APL = $10/(10/50) = $50,
That is, it would cost $50 to get one more unit if we held K constant.
What is the APK = 10/100 =0.1.
Holding L constant, compute the firm’s MC = r/APK = 30/(10/100) = $300,
That is, it would cost $300 to get one more unit if we held L constant.

How much K and L would we need to produce Q=20? A: Less than L=100, K=200. Suppose it took L=80, K = 160. Compute the new APL and APK.
APL = 20/80 = 0.25
APK = 20/160 = 0.125
Compute those MCs
Holding K constant: \( MC = \frac{10}{0.25} = 40 \)
Holding L constant: \( MC = \frac{30}{0.125} = 240 \)

Note – these are lower MCs than before.

A firm faces “Economies of Scale” when it can double its output for less than double the cost. A firm faces “Diseconomies of Scale” when its cost rise by more than double when it doubles output.

Economies of scale \( \rightarrow \) LRAC is falling
Diseconomies of Scale \( \rightarrow \) LRAC is rising

IRTS \( \rightarrow \) Economies of scale (If I double my inputs, my costs double, but my output more than doubles – thus, it must be possible to double my output for less than double the cost)
DRTS does not necessarily imply Diseconomies of Scale (Browning and Zupan get this wrong) – If I have DRTS, and I double my inputs, my costs double, but my output less than doubles – which does mean that LRAC is rising. However, even with DRTS, it may be possible to increase inputs in other combinations (e.g., triple labor, but keep capital unchanged) in such a way as to double output without doubling cost. Thus, it must be possible to double my output for less than double the cost (even with DRTS)

Since a firm is likely to have Economies of scale at low \( Q \), and Diseconomies of Scale at high \( Q \), it will have a U-Shaped LRAC.

Thus, MC is U-Shaped in the LR.

5) Relationship of SR and LR AC

Draw several SR AC curves. Note why the minimum points have a U-Shape (due to economies / diseconomies of scale).

Draw the LR AC curve as the bottom envelope. Discuss.

In the next chapter, we will show that competitive firms will produce at the minimum point of the LRAC curve. This point is defined as the “Minimum Efficient Scale”.

Note different industries have different MES levels of \( q \). Firms with large fixed costs usually have higher MES points – e.g., to produce cars requires an enormous fixed costs. Thus, the MES point for an automobile factory will tend to be high.

If demand is low relative to the MES point, you will tend to get a small number of firms.
Lesson 10

Review: Relationship of SR and LR AC

Draw several SR AC curves. Note why the minimum points have a U-Shape (due to economies / diseconomies of scale).

Draw the LR AC curve as the bottom envelope. Discuss.

Today, we will show that competitive firms will produce at the minimum point of the LRAC curve. This point is defined as the “Minimum Efficient Scale”.

Note different industries have different MES levels of q. Firms with large fixed costs usually have higher MES points – e.g., to produce cars requires an enormous fixed costs. Thus, the MES point for an automobile factory will tend to be high. Conversely, for a coffee shop, fixed costs are low, so MES is at a low level of output and thus you will have many coffee shops.

If demand is low relative to the MES point, you will tend to get a small number of firms.

Perfect Competition

1) Assumptions of perfect comp.
   • Large number of buyers and sellers – no one can affect the price by themselves.
   • Free entry and exit – no barriers. (including technological and legal/regulatory)
   • Homogenous product – firms cannot differentiate their good.
   • Perfect information – sellers know their cost structure and market price, buyers know preferences, prices, and quality of goods.
2) Profit = Revenue – Cost.
3) Revenue = P*Q
4) Cost is an increasing function of output C(Q)
5) Profit = P*Q – C(Q)
6) Firms cannot set P, they can only choose Q. Choose the Q that maximizes profit.
7) Graph Figure 9.2 (p. 249). Note that profit maximization occurs where MR = MC.
8) Calculus way: dProfit/dQ = P – dC/dQ = P – MC = 0. Thus, find Q such that P = MC.
9) Note: P = MR
10) Suppose MR > MC. Produce more.
11) If MR < MC, produce less.
12) MR = MC (This will be true for monopolists as well).
13) Graph MC, AC, AVC. Show profit in SR.
14) Regraph with AVC < P < ATC. Show losses. Why will you stay open in the short-run?
   Example: FC = 100, AVC = 9, P = 10, ATC = 11 at Q = 50. Revenue = 500, VC = 450. Can repay $50 of FC.
15) Show the SR and LR shut-down points.
16) What happens if input prices rise? Q falls.
17) What happens if market price rises? Trace out the firm’s SR supply curve.
18) Discuss the SR industry supply curve.

**Producer Surplus** = how much better off the firm is by producing Q* than not producing

Diagram
PS = Revenue – Variable Cost = Profit + Fixed Cost

Social Surplus = CS + PS + Tax Revenue – Government Expenditures + Positive externalities – Negative Externalities.

With no externalities and no government intervention, a competitive market produces the socially efficient quantity of output. Qe = Q*. Diagram this.

19) Discuss the LR firm supply curve. Go over Figure 9.9 (p. 257).
20) Discuss entry. Show what happens to the short-run market supply curve.
21) Discuss why all identical firms will earn zero profit and produce at the MES point in the LR.
22) Discuss why the LR supply curve is horizontal for a constant cost industry.
23) Constant cost industry – as industry output rises, input costs stay the same.
24) Increasing cost industry – as industry output rises, input costs rise. – get an upward sloped LR supply curve.
Lesson 11

1) Discuss the LR firm supply curve. Go over Figure 9.9 (p. 257).
2) Discuss entry. Show what happens to the short-run market supply curve.
3) Discuss why all identical firms will earn zero profit and produce at the MES point in the LR.
4) Discuss why the LR supply curve is horizontal for a constant cost industry.
5) Constant cost industry – as industry output rises, input costs stay the same.
6) Increasing cost industry – as industry output rises, input costs rise. – get an upward sloped LR supply curve.

PS and CS

- PS – note that PS = Revenue – Variable Cost. Does not equal profit (unless we are talking about the long run.
- Add CS and show why Q* is the surplus maximizing point. Suppose Q’<Q* -- then consumers could pay producers to produce more – thus not Q’ is not Pareto efficient
- Discuss Social MC and Social MB
- Rent control and DWL – show the gain and loss to consumers. Show the loss to producers. What is the argument for rent control – is it a good one?
- Discuss minimum wage laws – show the gain and loss to workers. Show the loss to firms. What is the argument for minimum wage laws – is it a good one?
- Discuss sales taxes. Show diagrammatically.
- Who bears the burden (incidence): Depends on the inelasticity of supply and demand. If demand is more inelastic than supply, consumers will bear the burden. If demand is less inelastic than supply, producers will bear the burden.
- Example:

Demand: Qd = 90 – 6P
LR supply curve: Qs = -1 + P

1) Graph the two curves:
2) Solve for equilibrium:

\[ 90-6P = -1 + P \]
\[ 91 = 7P \]
\[ 13 = P \]
\[ Qd = 90-6\times13 = 12 \]
\[ Qs = -1 + 13 = 12 \]

3) Is this a constant or increasing cost industry:
4) Compute CS, PS, Social Surplus = CS + PS.

\[ CS = \frac{1}{2} \times 2 \times 12 = 12 \]
PS = ½ * 12 * 12 = 72

5) Compute Elasticities at this point.

\[ Ed = \frac{\% \Delta Q_d}{\% \Delta P} \]
\[ = \frac{-6}{12} / \frac{1}{13} \]
\[ = -50\% / 7.6\% \]
\[ = -6.5 \]

\[ Es = \frac{\% \Delta Q_s}{\% \Delta P} \]
\[ = \frac{1}{12} / \frac{1}{13} \]
\[ = 8.3\% / 7.6\% \]
\[ = 1.083 \]

6) Suppose there is a $7 per Q tax. Compute the new equilibrium, CS, PS, tax revenue, and Social Surplus=CS + PS + tax revenue.

OLD LR supply curve: \( Q_s = -1 + P \)  OR  \( P = Q_s + 1 \)
NEW LR supply curve: \( P = Q_s + 1 + Tax = Q_s + 8 \)  OR  \( Q_s = -8 + P \)

90-6P = -8 + P
98 = 7P
14 = P
\( Q_d = 90-6*14 = 6 \)
\( Q_s = -8 + 14 = 6 \)

\( CS = \frac{1}{2} * (15-14) * 6 = 3 \)
\( PS = \frac{1}{2} * (7-1) * 6 = 18 \)

Tax Revenue = 7*6 = 42.
Social Surplus = 3 + 18 + 42 = 63. Note, this is less than old SS = 84.

7) Compute the DWL

\( DWL = \text{change in social surplus} = 84-63 = 21. \)
\( DWL = \frac{1}{2} * 7 * 6 = 21 \)

8) Compute the change in CS and change in PS – who bore the burden?

Change in CS = -9
Change in PS = 18-72 = -54

9) Compute the burdens.
Consumer: $1 \times 6 = $6  
Producer: $6 \times 6 = $36  

Discuss how a subsidy would be different.

• Example 2 – work with a partner:

Demand: Qd = 20 – P  
LR supply curve: Qs = -10 + 2P  

10) Graph the two curves:  
11) Solve for equilibrium:  

\[ P^* = 10, \, Q^* = 10 \]  

12) Compute CS, PS, Social Surplus = CS + PS.  

CS = 50, PS = 25, SS = 75  

13) Compute Elasticities at this point.  

\[ Ed = \frac{\% \Delta Qd}{\% \Delta P} = \frac{-1/10}{1/10} = -1 \]  
\[ Es = \frac{\% \Delta Qs}{\% \Delta P} = \frac{2/10}{1/10} = 2 \]  

14) Suppose there is a $9 subsidy per Q tax given to consumers. Compute the new equilibrium, CS, PS, government expenditure, and Social Surplus = CS + PS – gov’t expenditure.  

\[ P_c = 4, \, P_p = 13, \, Q = 16 \]  

Government expenditure = 16\times9 = 144  

\[ SS = \frac{1}{2} \times (20-4) \times 16 + \frac{1}{2} \times (13-5) \times 16 - 144 \]  
\[ = 128 + 64 - 144 \]  
\[ = 48 \]  

15) Compute the DWL  

\[ DWL = 48 - 75 = 27 \]
16) Compute the change in CS and change in PS – who received the larger share of the benefit of the subsidy?

Change in CS = 128-50 = 78
Change in PS = 64-25 = 39

17) Compute the shares of the subsidy.

Consumer: $6 * 16 = $96
Producer: $3 * 16 = $48

Discuss Imports and Tarriffs – Figure 10.10 and 10.11.
Lesson 12

Pass out HW4 – due next Monday
Second Exam is Nov. 16th

Demand for Labor

Firm’s demand for labor when labor is the only variable input (i.e., SR demand):

- Firm will hire labor so long as MR from one more worker-hour > MC of one more worker-hour.
- MPL = added output from one more unit of labor. For a competitive firm, P is the price/value of the added output. Thus, if I hire one more worker, my revenue will go up P*MPL.
- P*MPL is called the Marginal Value Product of Labor or MVPL. Most people call this the Marginal Revenue Product of Labor or MRPL. Why?
- Graph the MRPL – it is downward sloping because MPL is downward sloping. Why is MPL downward sloping?
- The MRPL is the demand curve for labor (when all else is fixed). Why?
- Note: w is the MC of one more worker-hour. We will hire workers so long as MRPL > w. We will stop hiring workers when MRPL = w. Note, this is the same as saying that MPL = w/P.

Firm’s demand for labor when all inputs are variable (LR demand):

- Firm will hire labor so long as MR from one more worker-hour > MC of one more worker-hour.
- When wage rate falls, the firm will hire more labor (SR). Then the firm will hire more capital (assuming that labor and capital are complements in the production process – see footnote on page 453). This increases the MPL at all levels of L. Why?
- Redraw Figure 16.2.
- Note that the LR demand curve is more elastic (flatter) than the SR curve.

The above describes the firm’s demand for labor. To get the industry demand for labor, we need to horizontally sum the demand curves (as we did in consumer theory).

- Problem – as all firm’s increase Q, Supply shifts outward and P falls.
- As P falls, MRPL falls and each firm’s demand curve for labor falls.
- Redraw graph 16.4
- Could the demand curve be upward sloping? No – the only reason that P falls is because supply is increased. Supply is increased only because the firms want to produce more q and are hiring more L. Thus, we can’t observe L falling when w falls (although, we could in theory see no change in L).

When is demand for Labor highly elastic? (Important question for determining deadweight losses caused by minimum wage laws, payroll taxes, and other issues pertaining to labor laws).
1. If demand for the industry’s product is elastic. Suppose that \( w \) increased a tiny amount. This would shift the product’s Supply curve in raise the price of the good. With highly elastic product demand, demand for the product would fall a lot. This would further erode the firm’s demand for labor and many less workers would be hired.

2. When inputs can be easily exchanged. For example if Labor can easily be exchanged with Capital, then the firm will switch to machines when \( w \) rises just a little bit. True when Isoquants are straight lines rather than L’s.

3. When supply of other inputs is highly elastic (e.g., if Capital prices don’t rise when you use more \( K \), the firm may be willing to switch to \( K \) and hire less \( L \)).

4. In the LR. We have already noted that LR firm demand is more elastic than SR, as in the LR you can substitute to other inputs.

Demand elasticity will be important when we talk about gov. intervention.

**Supply of Labor**

Start with the assumption of identical workers and a vertical (i.e., inelastic) Labor supply for all industries.

- What does this mean?
- Even given this assumption, you will still have more horizontal/elastic supply curves for a particular industry.
- In fact, the supply curve will be perfectly elastic for an industry if workers don’t care about the industry they work in.
- Importance: need to be careful in defining the market you talk about when you refer to supply elasticities.

**Individual Labor Supply**

- Choice is between work and leisure.
- Time is fixed = 168 hours per week.
- Budget constraint: Weekly income = wage * hours worked = wage * (168 – leisure).
- Choice between leisure and other goods.
- “Price” of leisure = wage. Every hour of leisure costs me \$w\) of other goods.
- I have preferences between leisure and other goods and indifference curves. Thus, the choice can be analyzed using consumer theory.
- Example: wage = \$10 per hour. Graph this. Note that the slope of the budget constraint is the wage. Budget constraint = $1,680 – w*Leisure.
- Explain the equality of the MRS and the wage rate at the optimal choice. – MRS is the dollars of other goods that I am willing to give up to get one more hour of leisure. \( W \) is the amount of other goods that I have to give up to get one more hour of leisure. If MRS > \( w \), then I am working too much. If MRS < \( w \), then I am not working enough.
- What happens if wage rises? Budget set rotates. Other goods are now cheaper. Note: relative price of leisure rises. Why?
Other goods | Leisure | Labor
---|---|---
Substitution Effect | Positive | Negative | Positive
Income Effect | Positive (normal) | Positive (normal) | Negative
Total Effect | Positive | ? | ?

Go over figure 17.2 (p. 479)
- Suppose the substitution effect dominates the income effect. Then when \( w \) rises, Leisure falls and labor rises – this would give us an upward sloping labor supply curve. Graph this.
- Now suppose that the income effect dominates the subs. effect. Then when \( w \) rises, Leisure rises and labor falls – this would give us a \textit{downward} sloping labor supply curve.
- Above some threshold wage, most workers will probably have a backward bending supply curve. If you paid me $100,000 per hour, I guarantee you that I would work less than I do now – I would probably work about 100 hours a year.

Kinked budget sets

1. Overtime pay law -- one-and-a-half. Wage above 40 hours of work is 15 per hour. Kink at $400. New y-intercept is at $400 + ($15*128) = $2320.
   - What would happen if the worker worked 45 hours before the policy change? A: Could increase or decrease labor supply.
   - What would happen if the worker worked 30 hours before the policy change? A: Could either increase or have no effect on labor supply.
2. Welfare.
   - Suppose we offer $100 and reduce the benefit by wage earnings * 50%.
   - New budget constraint:
   - Work more than 20 hours – no change in budget line – might work the same or less.
   - Work less than 20 hours, effective wage is now $5 per hour – that is, leisure is now relatively cheaper – effect:

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<td>Total Effect</td>
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</table>

Market Supply

Horizontally sum individuals – could be upward, downward, or vertical. Studies place the overall elasticity of labor around +0.2. Indicating that we are in the upward sloping region on average. However, this is fairly inelastic – important for subsequent policy analysis. One piece of evidence – we are far wealthier than we were at the turn of the century, but we work about the same number of hours (on a household basis).
A nation’s overall average wage rate is determined by the intersection of its overall labor supply curve (which is inelastic) and its demand curve (which depends on MPL). Countries with high MPL will have higher average wages.

When will a country have a high MPL?

- High level of K/L
- Highly educated workers
- High degree of technological know-how
- Etc – long list.

A big change in the labor supply can also affect wages. In the 1970s, the baby-boomers and women entered the workforce and wages stagnated. Also during this decade, productivity did not rise as fast as it had in prior decades.

**Separate Labor Markets**

Can separate our analysis into low-skilled and high-skilled workers. Same models apply – we would get two market wage rates.

Graph this. Higher MPLs for skilled workers. Why does anyone supply their labor to the unskilled market?

Lots of evidence that the return to getting a college degree increased during the 1980s and 1990s. MPL for these workers increased.

Over-time workers could adjust and get new skills – As a result, we would expect that more workers would get college degrees – what effect would this have on wages? Increase for non-skilled and decrease for skilled.

**Social Security**

Both employees and employers pay 7.65% (although, this is capped at an income of $84,900). Intent: for employees and employers to equally share the costs.

Figure 18.2 (p. 511): Graph the supply and demand curve – show that it doesn’t matter who pays the tax – workers in this example pay $1.50 and firms pay $0.50. Why? Supply is more inelastic than demand – the one that is more inelastic bears more of the burden.

Overall supply is very inelastic – workers bear most of the burden.

If it doesn’t matter, why not place all of the tax on the workers? Political reality – it may be easier to sell a program that splits the supposed costs.
Discrimination

Go over figure 18.8.
Bottom-line: Even if some employers discriminate against minorities/women, one should not observe differences in wages paid – although you would observed segregated labor forces.

If this is not the explanation of wage disparities, what is? Books answer:

- Differences in productivity (i.e., actual separate markets)
  - Blacks are typically younger.
  - Blacks have less and lower quality schooling.
  - Blacks score less on standardized tests.
  - Black men are less likely to be married.
  - Child rearing has more effect on careers women than men.
  - Women tend to choose college majors that pay less.

- However, these explanations only explain ½ to ¾ of the difference.

What do you think?
Lesson 13

Discrimination

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  - Child rearing has more effect on careers women than men.
  - Women tend to choose college majors that pay less.
- However, these explanations only explain $\frac{1}{2}$ to $\frac{3}{4}$ of the difference.

What do you think?

Market Failures

Up to now, we have been dealing with competitive markets, with perfect information, and no externalities. In these markets, we have shown that government intervention, even if well intentioned, leads to reductions in economic efficiency (i.e., Deadweight losses). Such interventions *might* be warranted to correct perceived inequities. That is, we might want to trade off some loss in efficiency for a gain in equity.

Now, for the remainder of the course, we discuss situations in which government intervention increases economic efficiency. In these cases, we say that there is a "market failure."

Monopolies

1) Reasons for monopolies:
   a. barriers to entry
      i. absolute cost advantage (LRAC lower than rival firms),
      ii. Natural monopoly (downward sloping LRAC curve with no minimum – economies of scale throughout, infinite MES point)
      iii. Product differentiation.
      iv. Regulatory barriers (patents, licensing a certain number of entrants).
   2) Face a downward sloping demand curve.
   3) Monopolies can set both price and quantity.
   4) Problem: choose the price and quantity along the demand curve that maximizes profit.
   5) Example: $P = 100 - 5Q_d$. Plot this demand curve.
   6) Revenue = $P*Q = 100Q - 5Q^2$
7) Marginal Revenue = dRev/dP = 100 – 10Q. Plot this curve. Note: with a linear demand curve, MR is always linear and intersects Q axis at ½ of the demand curve.
8) That is, if P=a-b*Qd then MR=a-2*b*Qd
9) Add a MC curve.
10) Profit maximization occurs when MR = MC. Note, this is the same as for perfect competition, but in perfect competition, the MR curve is flat.
11) Add the AC curve. Show the profit of the firm.
12) Note: Pareto efficiency requires that P=MC. What would happen if p & q were set where MC crosses the demand curve (i.e., where P=MC)? Firm could earn negative profit.
13) What would happen if p & q were set where AC crosses the demand curve? Firm would earn zero profit.
14) Suppose Cost = 100+16Q+Q^2.
   a. Marginal Cost = 16 + 2Q.
   b. MR = MC: 100 – 10Q = 16+2Q 84 = 12Q, Q = 84/12 = 7.
   c. P = 100 – 5*7 = 65.
   d. MC = 16 + 2*7 = 30.
   e. AC = 100/Q + 16 + Q = 100/7 + 23 = 37.2. Note: P>AC, thus earning a profit.
   f. Profit = Revenue – Cost = P*Q – Cost = 65*7 – (100+16*7+7^2) = 455 – (100+112+49) = 455 – 261 = 194.
15) Alternative equation for profit maximization: (P – MC)/P = 1/|η|. The LHS is the percentage mark-up. The RHS is the inverse of price-elasticity. If η is high (i.e., highly elastic demand), the mark-up will be small. Thus, monopolists stand to gain the highest profit when demand is not elastic.
   a. “Mark-up” = P-MC = 35.
   b. Percentage mark-up = 35/65.
   c. If Q=8, P=60. Elasticity = %DQ / % DP = (1/7) / (5/65) = 65/35
16) Monopolies have no supply curve.
17) Show the position of the LRAC curve if monopolists profits equal zero.
18) Graph the Total revenue curve. Note where MR is positive and negative. Explain why price elasticity must be greater than one where MR is positive.

Discuss DWL caused by monopolies.
What can be done about monopolies:
   Regulate price
   Prevent monopolies from emerging.
   Section 1 of the Sherman Act: prohibits contracts, combinations, or conspiracies in restraint of trade. Includes parallel conduct (i.e., implicit collusion).
   Section 2 of the Sherman Act: prohibits monopolization of a market.
Lesson 14

Product pricing with monopolies.

NOTE: I have not yet written these lecture notes.